



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

ROT OF DATE FRUIT¹

J. G. BROWN

(WITH FIVE FIGURES)

In the autumn of 1917, Dr. A. E. VINSON of the Arizona Experiment Station brought to the writer a small box of dates from the Yuma date orchard with the request that the organism with which they were badly infected be determined. The fruits were carefully examined, but it was impossible to give the requested information without further investigation; and it was suggested by Professor THORNBERRY, Botanist of the Station, that since the problem concerned food conservation it would be especially profitable to attack it at once. The advice was acted upon, and the results are partly set forth in this preliminary paper.

For the purpose of observing the disease in the field, a trip was made to the orchard in December 1917, and a careful inspection of trees and fruit was undertaken. A glance at the figures will show that abundant evidence of disease was not difficult to find. The ground under many of the trees was thickly covered with the spoiled fruit (fig. 1), and numerous clusters still hanging to the trees suggested a severe attack of "plum pockets," for a large percentage of the fruit had become mummified (fig. 2). Some of the fruit on the ground was covered with molds, and similarly infected fruit was found wedged between the leaf bases and tree trunks and on the ground half buried in the soil. Of the several varieties of date palms comprising the orchard, the Deglet Noor appeared to be the favorite host. It was stated that the year had been an especially bad one, about 90-95 per cent of the crop being infected. The fruit was selling at the orchard at 35-45 cents per pound. Since many of the trees produce from 200 to 400 pounds of salable fruit under normal conditions, the loss was considerable.

Both Yuma and Tempe date orchards were affected much less by the rot in 1918 than in 1917. Table I gives precipitation and

¹ Preliminary paper.

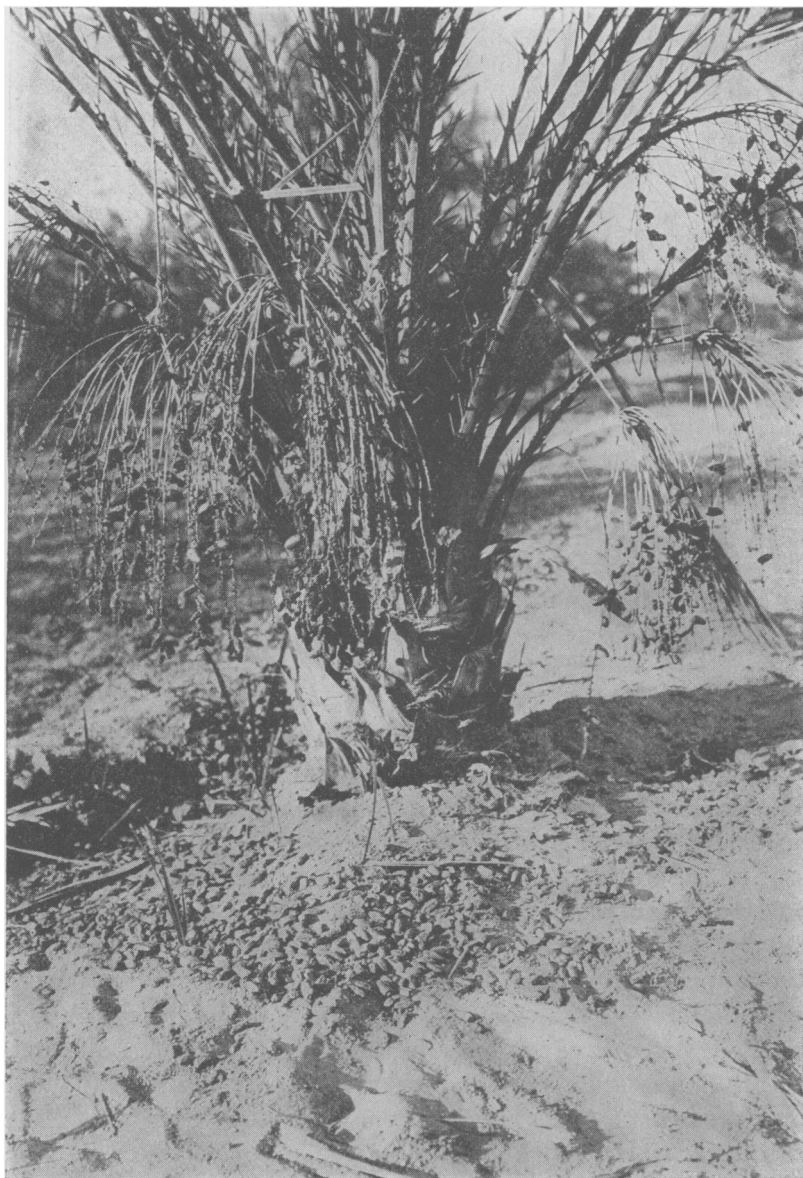


FIG. 1.—Deglet Noor variety showing ravages of date rot disease; note mummies still hanging to tree and on ground.

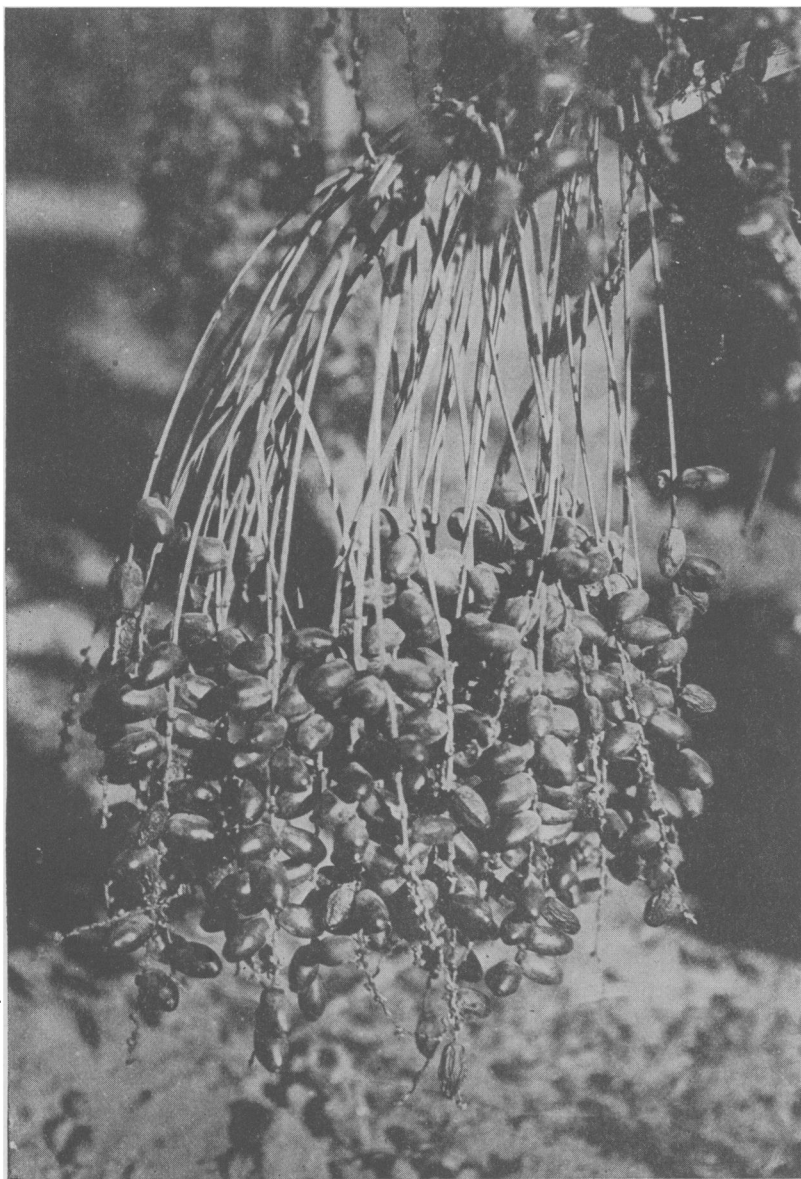


FIG. 2.—Various stages of date rot and mummification

temperature data for the Yuma date orchard covering the two years. Table I suggests that the greater prevalence of the fungi concerned in the rot of the date fruit in 1917 was possibly due to the more favorable conditions of moisture and temperature during April, May, and June, while flowering and fruit setting were in progress. From observations it appears probable that infection occurs at that time. The spring and summer of 1917 had not only an excess of moisture over the same period of 1918, but were also cooler, so that this additional moisture was more effective.

SYMPTOMS.—The fruits showed two main symptoms. Some were flecked with rusty brown spots from the size of a pinhead to areas almost covering one side of the fruit (fig. 4); others showed soft spots varying in size and partly translucent, as though soaked with water or oil (fig. 5). The brown spots gradually increased in size, often coalescing, forming a dark chocolate margined area oval in outline, with depressed, light cream or grayish centers on which clusters of spores finally appeared in pustules (fig. 4, third fruit, third row). The soft spots also enlarged to a similar extent, giving an appearance of rot. In both cases the ruptured epidermis allowed excessive water loss, resulting in the final mummy stage. Mummified fruits sometimes remained for a time in situ, but sooner or later fell to the ground (figs. 1 and 3). The exposed sweet pulp, in the early stages of the soft spots, attracted swarms of small flies and other insects which hovered in and around the fruit clusters, and probably aided materially in carrying the infection.

Examination of the trees revealed numerous brown spots on petioles and ribs of leaves, which also extended down the rhachi of fruit clusters. This suggested a relation between fruit spot and leaf spot, which appears to be confirmed by the laboratory experiments so far completed. In the Tempe date orchard palms three years old already showed the brown spots on the leaf bases.

LABORATORY STUDIES.—Cultures have been made from the spots on leaves, rhachi, and fruits collected in both orchards. The medium used was date agar, prepared according to the method described by SHEAR and STEVENS² for prune agar by substituting

² SHEAR, C. S., and STEVENS, N. E., Bur. Pl. Ind. Circ. no. 131.



FIG. 3.—Cluster of date fruit from left side of tree shown in fig. 1, showing most of fruit fallen, owing to attack of spot and rot fungi.

TABLE I

	January	February	March	April	May	June	July	August	September	October	November	December
	Comparative precipitation 1917											
Precipitation in inches.....			00	0.27	0.05	00	0.93	0.24	0.18	00	00	00
Departure from normal.....			-0.26	+0.20	+0.05	-0.06	+0.59	-0.64	+0.09	-0.24	-0.27	-0.41
	1918											
Precipitation in inches.....	0.62	0.15	0.63	00	00	00	00	0.39	00	0.15	0.12	0.27
Departure from normal.....			+0.37	-0.07	00	00	-0.34	-0.49	-0.09	-0.09	-0.15	-0.14
	Comparative temperatures 1917											
Temperature.....	53.3		59	65.7	69.2	81.2	88.4	86.6	84.2	74.4	60.3	56.6
Departure from normal.....			-1.5	+0.01	-1.5	+2.8	+2.4	+0.5	+4.9	+6.2	+1.5	+6.3
	1918											
Temperature.....	53.3	56.7	64.8	68.4	71.8	86.2	87.9	83.7	73.6	58.6	51.6
Departure from normal.....	+1.6	+1.1	+4.3	+2.8	+1.2	+7	+1.9	+3.7	+4.5	-0.3	+ .7

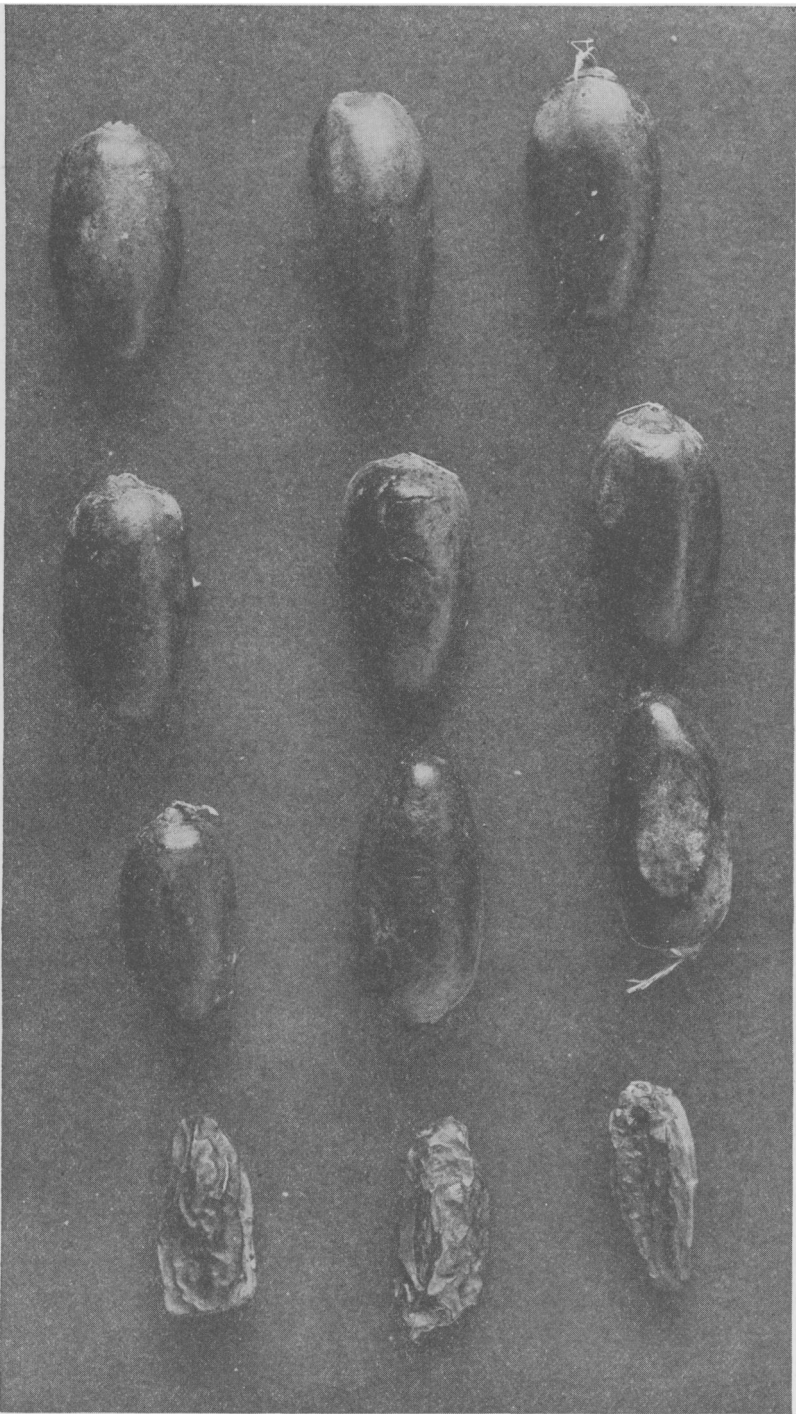


FIG. 4.—Progressive stages in mummification of date fruit, due to spot fungus; spots rusty brown at first, then dark chocolate to black, margined with lighter depressed centers.

dates for prunes. Infected spots in all three situations gave typical *Alternaria* spores similar to those found in pustules. Besides this fungus, two species of *Aspergillus* and one species of

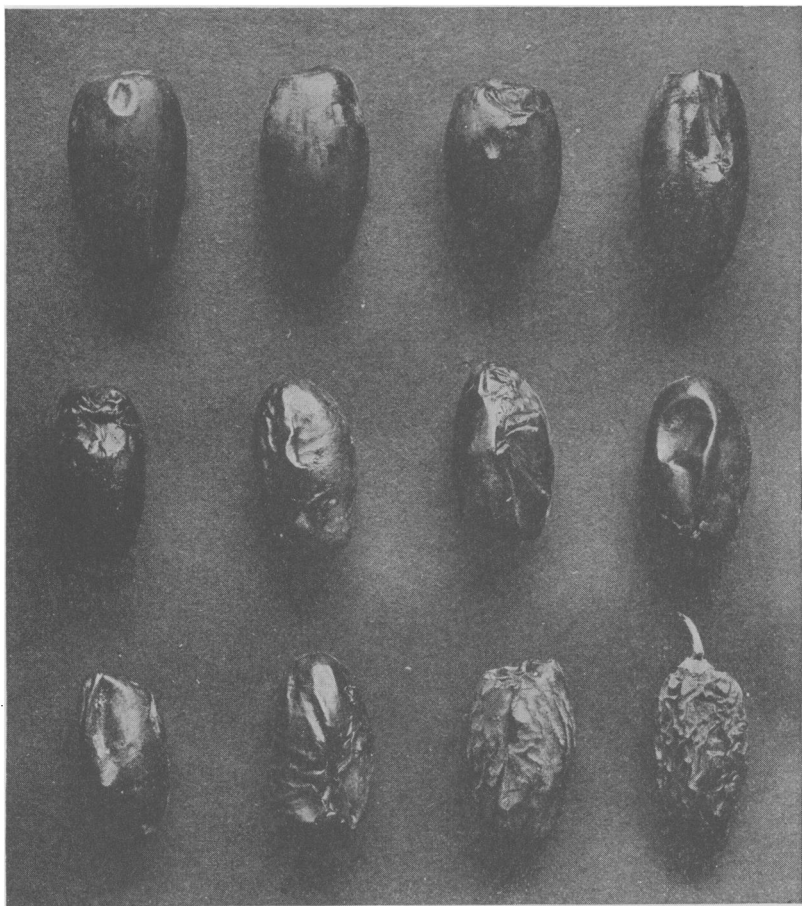


FIG. 5.—Stages in rotting and drying out following attack of *Alternaria*, *Aspergillus*, and *Penicillium*, showing spots having a water-soaked appearance at first.

Penicillium usually appeared. The method of inoculation consisted in the removal of a block of infected tissue with a flamed scalpel after sterilization of the surface. The fungi appearing on the agar have all been isolated and grown in pure culture. On old

agar cultures numerous perithecium-like, carbonaceous structures have appeared, which are now under histological and physiological investigation. In no instance, thus far, have they produced spores on artificial media, nor do they appear on infected material that has been examined.

An important phase of the date rot problem is the difficulty with which stored fruits are kept. Since another investigator is working on methods of preserving date fruit, it will suffice to state that the same saprophytic molds that occur in infected petioles, rhachi, and fruits on the tree are likely later to ruin the packed crop.

CONCLUSIONS.—From the writer's preliminary observations and experiments, it appears probable that the primary cause of rot and mummification of the date fruit is the attack of *Alternaria*. This attack paves the way for the entrance of saprophytic *Aspergillus* and *Penicillium* species which bring on the disintegration of the pulp. Commonly all three fungi appear in cultures from the same infected spot. Attack of the spot fungus, unaccompanied by the saprophytic *Aspergillus* and *Penicillium*, results in mummification without the appearance of rot.

LITERATURE.—There appears to be no literature available on diseases of the date in this country, a statement borne out by communications from the Bureau of Plant Industry. Some European investigators have mentioned a species of *Sterigmatozystis* as the cause of the rot of date fruit in Africa, but this fungus has not yet appeared on any of the Arizona material examined. *Meliola* has also been mentioned in connection with the spot of the leaf of date palms, but it also is absent from cultures made in this laboratory. Further study is needed to determine the species of *Alternaria*, *Aspergillus*, and *Penicillium* isolated in cultures. This work, together with histological investigation and inoculation experiments, is already under way, and it is hoped that a further report may be ready soon.

AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF ARIZONA
TUCSON, ARIZ.